GATE ME 2025 Question Paper

Time Allowed : 3 Hours	Maximum Marks : 100	Total Questions :65

1. Given the following data:

$$\text{V.R} = 1:2, \quad \phi = 15^\circ, \quad m = 10\,\text{mm}, \quad \text{add} = 10\,\text{mm}$$

Find the minimum number of teeth required on the pinion.

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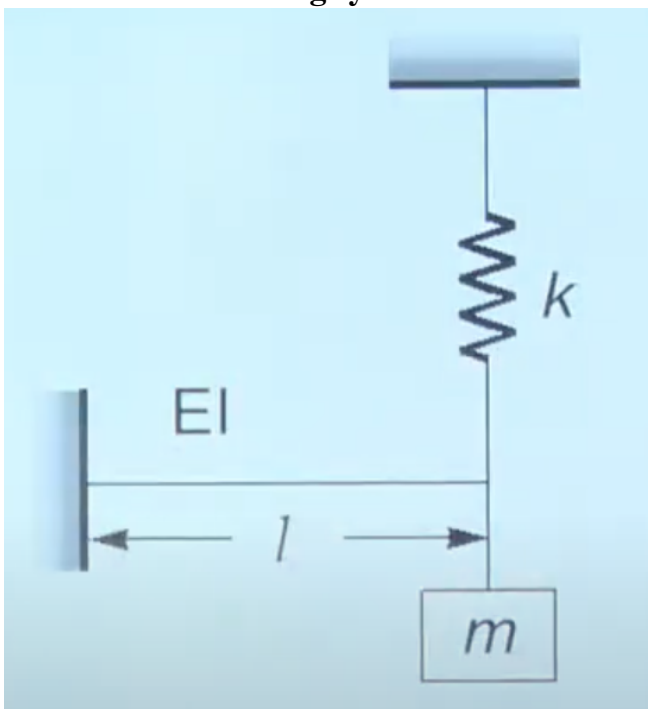
2. Given the following system:



$$EI, \quad l, \quad m, \quad k$$

Find the natural frequency ω_n of free oscillation.

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3. If the damping factor or damping ratio is equal to

$$\frac{\omega_d}{\omega_n} \quad \text{then} \quad \xi?$$

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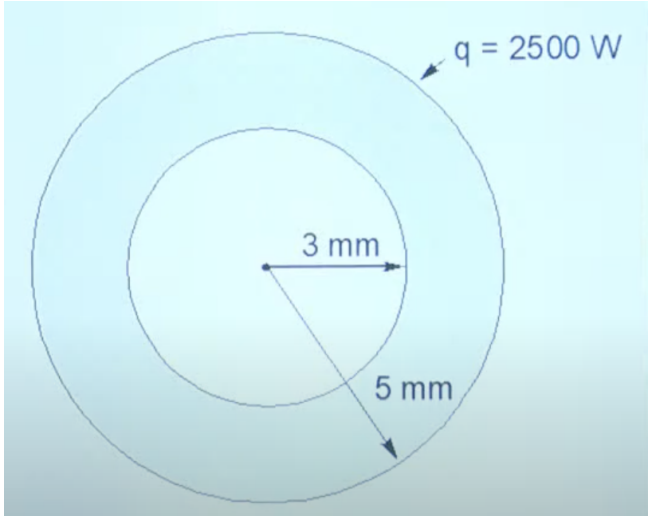
4. Air at 30°C, a spherical ice cube at -7°C exposed to air with gravity. What will be the air direction?

5. Heat is incident on the plate is 2500 W. 85% of heat is absorbed by the plate of 5 mm radius while 65% absorbed by the plate of 3 mm radius. Heat density absorbed by shaded area is .....W/m.



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6. Water is flowing through a pipe. The inlet and outlet temperature of water are 293 K and 353 K respectively. If the mass flow rate of water is 0.01 kg/s and the diameter of the tube is 60 mm, then what is the length of the tube if a constant heat flux of 2000 W/m^2 is subjected to the wall of the pipe?

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7. A square threaded screw is used to lift a load W by applying a force F. The efficiency of the square threaded screw is expressed as:

(a) $\frac{W}{F}\cos\alpha$

(b) $\frac{W}{F}\tan\alpha$

(c) $\frac{W}{F}\cos\phi$

(d) $\frac{W}{F}\tan\phi$

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8. The velocity vector for a flow is given by:

$$\vec{V} = 3x\hat{i} + Cx\hat{k}$$

For an irrotational flow, the value of C is:

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9. Select the correct option for fully developed pipe flow:

(a) Compressibility becomes important when Mach number is less than 0.3.

(b) For the same maximum velocity, the average velocity of turbulent flow is larger than that of laminar flow.

(c) The friction factor is independent of surface roughness in laminar flow.

(d) In laminar flow, the friction factor decreases with decrease in Reynolds number.

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10. A Pitot tube is used to measure the velocity of air flowing in a wind tunnel which has a density of 1.23 kg/m^3. The density of water is 1000 kg/m^3, SG of manometric fluid is 13.6, and the meniscus height is 30 mm. Find the velocity of air in the wind tunnel.

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11. For a production system, annual demand is 3000 units and the cost of placing one order is 150. The holding cost is 40% of the unit price of inventory, and the items can be purchased in the lot as given below. Determine the best order size.

Lot Size	Price (/unit)
0 - 499	9 /unit
500 - 999	8.5 /unit

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12. The condition of steam at the inlet and outlet of the turbine is given below:

Superheated condition

$$h_1 = 3344\,\text{kJ/kg}, \quad S_1 = 6.5\,\text{kJ/kgK}$$

At condenser pressure

$$S_f = 1.1\,\text{kJ/kgK}, \quad S_g = 7.6\,\text{kJ/kgK}, \quad h_f = 341\,\text{kJ/kg}, \quad h_g = 2645\,\text{kJ/kg}$$

$$\text{Mass flow rate} = 102\,\text{kg/s}, \quad \text{Isentropic efficiency} = 0.9$$

Calculate the turbine power in MW.

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13. A hydrogen gas having a polytropic index of 1.3 and $\gamma = 1.4$, if the work done by the gas is 400 kJ, then heat transfer is:

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14. A pump is working on a reversed Carnot cycle between temperature limits 300 K and 280 K. Heat lost through the room is 15 kW. What is the power input?

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15. A work is done on an insulated rigid cylinder with the help of a stirrer. Which of the following statements are correct?

(a) Enthalpy and entropy both increase.

(b) Enthalpy and entropy both decrease.

(c) Enthalpy and entropy both remain constant.

(d) Enthalpy remains constant but entropy increases.
